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A PAPER was read "On the construction of large Achromatic Telescopes." By A. Rogers, Esq.—In this paper the author describes a new construction of an Achromatic Telescope, the object of which is to render a small disc of flint glass available to perform the office of compensation to a much larger one of crown, and thus to render possible the construction of telescopes of much larger aperture than are now common, without hinderance from the difficulty at present experienced in procuring large discs of flint glass. It is well known that in the ordinary construction of an achromatic object-glass, in which a single crown lens is compensated by a single one of flint, the two lenses admit of being separated only by an interval too small to afford any material advantage in diminishing the diameter of the flint lens, by placing it in a narrower part of the cone of rays, the actual amount of their difference in point of dispersive power being such as to render the correction of the chromatic aberration impossible, when their mutual distance exceeds a certain limit.

This inconvenience Mr. Rogers proposes to obviate, and obtain the advantage in question, by employing as a correcting lens, not a single lens of flint, but a compound one consisting of a convex crown and concave flint, whose foci are such as to cause their combination to act as a plane glass on the mean refrangible rays. Then it is evident, that by reason of the greater dispersive power of flint than of crown glass, this will act as a concave on the violet, and as a convex on the red rays; and *that* the more powerfully, according as the lenses separately have greater powers or curvatures. If, then, such a compound lens be interposed between the object-glass of a telescope, supposed to be a single lens of plate or crown glass, and its focus, it will cause no alteration in the focus for mean rays, while it will lengthen the focus for violet, and shorten it for red rays. Now this is precisely what is wanted to produce an achromatic union of all the rays in the focus; and, as nothing in this construction limits the powers of the individuals composing the correcting lenses, they may therefore be applied any where that convenience may dictate; and thus, theoretically speaking, a disc of flint glass, however small, may be made to correct the colour of one of crown, however large.

But this construction possesses other and very remarkable advantages. For, first, when the correcting lens is approximately constructed on a calculation founded on its intended aperture, and on the refractive and dispersive indices of its materials, the final and complete destruction of colour may be effected, not by altering the lenses by grinding them anew, but by sliding the combination nearer

to, or further from, the object-glass, as occasion may require, along the tube of the telescope, by a screw motion, till the condition of achromaticity is satisfied in the best manner possible. And, secondly, the spherical aberration may in like manner be finally corrected by slightly separating the lenses of the correcting glass, whose surfaces should for this purpose be figured to curvatures previously determined by calculation, to admit of this mode of correction — a condition which the author finds to be always possible.

Mr. Rogers explains his construction by reference to a diagram, and states the rule for the determination of the foci of the lenses of the correcting glass in a formula, which may be thus interpreted. "The focal length of either lens of the correcting lens is to that of the object-glass, in a ratio compounded of the ratio of the square of the aperture of the correcting lens to that of the object-glass, and of the ratio of the difference of the dispersive indices of crown and flint glass, to the dispersive index of crown:"—for example, to correct the colour of a lens of crown or plate glass of nine inches aperture, and fourteen feet focal length (the dimensions of the celebrated telescope of Fraunhofer at Dorpat) by a disc of flint glass three inches in diameter, the focus of either lens of the correcting lens will require to be about nine inches. To correct it by a four inch disc will require a focus of about sixteen inches each.

The author then remarks, that it is not indispensable to make the correcting glass act as a plane lens. It is sufficient if it be so adjusted as to have a shorter focus for red rays than for violet. If, preserving this condition, it be made to act as a concave lens, the advantage procured by Mr. Barlow's construction of reducing the length of the telescope with the same focal power, is secured: and he considers, moreover, that by a proper adaptation of the distances, foci, &c. of the lenses, we might hope to combine with all these advantages that of the destruction of the secondary spectrum, and thus obtain a perfect telescope.

There was also read a portion of a paper "On the Occultation of ϑ Piscium observed in Blackman Street, in the month of February 1821. References to recorded observations of occultations in which peculiarities have been apparently seen, either at the moon's limb, or upon her disc; together with an inquiry how far certain hypotheses seem adequate to account for the phenomena. By James South, Esq."

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